Glenn Research Center, Occupational Health Manual

Chapter 4 – RESPIRATORY PROTECTION PROGRAM

NOTE: The current version of this chapter is maintained and approved by the Safety, Health, and Environmental Division (SHED). The last revision date of this chapter was February 2007. The current version is maintained on the Glenn Research Center intranet at http://smad-ext.grc.nasa.gov/emo/pub/ohpm/ohpm-manual.pdf. Approved by: Occupational Health Branch Chief, Gayle Reid

- Important things you need to know about respiratory protection.

PURPOSE
This chapter establishes minimum requirements for the NASA Glenn Research Center's Lewis Field (GRC) and Plum Brook Station Respiratory Protection Program. It is intended to ensure employee protection from hazardous airborne materials through the implementation of engineering, work practice, and administrative controls to minimize employee exposure. When these controls do not effectively reduce employee exposures to safe levels, they will be used in conjunction with respiratory protection. The Program is established in accordance with the Occupational Safety and Health Administration Respiratory Protection Standard, 29 CFR 1910.134.

APPLICABILITY
The Respiratory Protection Program is applicable to civil servant employees who use respirators for protection of health or who may, on an emergency response basis, need to use respirators at the GRC and Plum Brook Station. Contractors at GRC and Plum Brook who have employees using respiratory protection are required to have their own site specific written respiratory protection program that meets federal, state and NASA requirements.

DEFINITIONS
Air-Purifying Respirator
A respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.

Atmosphere-Supplying Respirator
A respirator that supplies the respirator user with breathing air from a source independent of the ambient atmosphere, and includes supplied-air respirators (SAR's) and self-contained breathing apparatus (SCBA) units.

Demand Respirator
An atmosphere-supplying respirator that admits breathing air to the face piece only when a negative pressure is created inside the face piece by inhalation.

Canister or Cartridge
A container with a filter, sorbent, or catalyst, or combination of these items, which removes specific contaminants from the air passed through the container.

Emergency Situation
Means any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.

Employee Exposure
Means exposure to a concentration of an airborne contaminant that would occur if the employee were not using respiratory protection.

End-Of-Service-Life Indicator (ESLI)
Means a system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective.

Engineering Controls
Are methods of controlling employee exposures to toxic materials by modifying the source or reducing the quantity of contaminants released into the workroom environment.

Escape-Only Respirator
A respirator intended to be used only for emergency exit.

Filter Or Air Purifying Element
A component used in respirators to remove solid or liquid aerosols from the inspired air.

Filtering Face Piece (Dust Mask)
A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.

Fit Test
Means the use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual. (See also Qualitative fit test QLFT and Quantitative fit test QNFT.)

Hazard Assessments
Industrial hygiene evaluation of the health hazards posed by a specific operation or task.

High Efficiency Particulate Air (HEPA) Filter
Means a filter that is at least 99.97% efficient in removing monodisperse particles of 0.3um in diameter. The equivalent NIOSH 42 CFR 84 particulate filters are the N100, R100, and P100 filters.

Hood
A respiratory inlet covering that completely covers the head and neck and may also cover portions of the shoulders and torso.

Immediately Dangerous To Life Or Health (IDLH)
Means an atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

Loose-Fitting Face Piece
A respiratory inlet covering that is designed to form a partial seal with the face.

Negative Pressure Respirator (Tight Fitting)
A respirator in which the air pressure inside the face piece is negative during inhalation with respect to the ambient air pressure outside the respirator.

Oxygen Deficient Atmosphere
Atmosphere with oxygen content below 19.5% by volume.

Permissible Exposure Limit (PEL)
The airborne concentration of a substance that, even on repeated daily exposure, will pose no adverse health effects to nearly all workers. PEL's are published and enforced by the Occupational Safety and Health Administration as a legal standard.

Positive Pressure Respirator
A respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.

Powered Air-Purifying Respirator (PAPR)
Air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

Pressure Demand Respirator
A positive pressure atmosphere-supplying respirator that admits breathing air to the face piece when the positive pressure is reduced inside the face piece by inhalation.

Qualitative Fit Test (QLFT)
A pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent. QLFT provides only a pass/fail result.

Quantitative Fit Test (QNFT)
An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

Respiratory Inlet Covering
A portion of a respirator that forms the protective barrier between the user's respiratory tract and an air-purifying device or breathing air source, or both. It may be a facepiece, helmet, hood, suit, or a mouthpiece respirator with nose clamp.

Self-Contained Breathing Apparatus (SCBA)
An atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

Service Life
Is the period of time that a respirator, filter or sorbent, or other respiratory equipment provides adequate protection to the wearer.

Supplied-Air Respirator (SAR) or Airline Respirator
An atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.

Threshold Limit Value (TLV)
The airborne concentration of a substance to which nearly all workers may be repeatedly exposed without adverse health effects.

Tight-Fitting Face Piece
A respiratory inlet covering that forms a complete seal with the face.

User Seal Check
An action conducted by the respirator user each time a respirator is worn to determine if the respirator is properly seated to the face.

POLICY
The Glenn Research Center (GRC), as part of its effort to provide a safe and healthful work environment, is committed to protect all employees from exposure to harmful concentrations of hazardous or toxic dust, fumes, mists, vapors, gases, or oxygen-deficient atmospheres. Where effective engineering controls are not feasible or while they are being instituted, respiratory protection measures described herein shall be used to protect workers.

RESPONSIBILITIES
Occupational Health Branch: Industrial Hygienists

- Administer, develops and implements a Respiratory Protection Program that complies with the requirements of all regulations
- Conducts hazard assessments to determine where respiratory hazards are present.
- Provide Training
- Provides guidance on the selection, use, and fitting of respiratory protection.
- Provides information on the specific use of the respirator to the Physician or Other Licensed Health Care Professional (PLHCP)
- Performs exposure assessments for tasks requiring the use of respiratory protection
- Develops cartridge change-out schedules for respirators used to protect against gases and vapors
- Performs periodic program evaluation to ensure continued effectiveness.
- Audits on-site contractor’s Respiratory Protection Program for compliance and effectiveness

Occupational Health Branch: Technical Specialists

- Conducts annual fit tests.
- Coordinate SCBA cylinders evaluations and inspections

Medical Services

- Administers medical questionnaire and conducts spirometry test and respirator physical annually.
- Provides a written opinion regarding the employee's physical ability to use a respirator, any limitations of use, and the need for any follow-up evaluations to IH.
- Maintains records of medical evaluations.

Plum Brook Management Office (PBMO)

- Administers this Respiratory Protection Program for Plum Brook Station.

Supervisors

- Contact IH to perform a hazard assessment of a task that may pose an inhalation concern
- Assist IH in identifying needed hazard evaluations.
- Know the hazards or tasks in their areas that require respiratory protection
- Know the types of respirators that need to be used
- Enforce the requirements of the Respiratory Protection Program in their area
- Ensure that employees are knowledgeable about the respirator requirements for the areas in which they work and the tasks they perform
- Complete Respiratory Protection Program training for supervisors.

Employees

- Comply with all aspects of the program including but not limited to annual respirator fit testing, annual respirator training, and annual medical spirometry tests.
- Comply with the proper procedures for using, cleaning, maintaining, and storing the respirator
- Support IH in conducting a hazard assessment for a task that may pose an inhalation concern.
- Notify IH when using the respirator for materials other than those in the most recent hazard assessment.
- Wear the respirator that they were fit tested with
- Wear the recommended filter, cartridge or canister for the hazard they will be exposed to
- Perform a user seal check before entering into a hazardous environment.
- Contact IH to schedule an exposure assessment

Contractors

- Contractors shall comply with the Glenn Respiratory Protection Program

Contracting Officer Technical Representatives (COTR's)

- Forward compliance concerns to Contractor's Project Manager and ensure compliance concerns are addressed.

Students

- Co-op students are employees of GRC and are included in the GRC Respiratory Protection Program
- Student interns are employees of their respective universities and thus would not be covered by the GRC Respiratory Protection Program; however, since the student is working in the confines of GRC, IH can assist by conducting a hazard assessment of the operation.

REQUIREMENTS

Hazard Assessment

A hazard assessment must be performed to determine if respiratory protection is needed. During the hazard assessment, several factors will be investigated including:

- The nature of the task being performed and the potential for generation of airborne contaminants
- The physical, chemical, and toxic properties of the material
- The concentration and duration of exposure
- The frequency of exposure
- The environmental factors (heat and humidity)

- Worker exertion level while performing the task
- Other protective equipment needed
- The potential for engineering and administrative controls

If an inhalation hazard is identified based on information from the hazard assessment, IH will recommend the installation of controls. Engineering and administrative controls such as ventilation, chemical substitution, and limiting or restricting personnel access to areas will be used whenever feasible and practical. When engineering controls are not feasible and practical, or do not completely eliminate the hazard, respiratory protection will be used. Respirators may be used for tasks that are of short duration, infrequent or non-routine, respiratory protection can be used.

The user will not wear a respirators in unknown atmospheres or in the presence of hazardous materials other than those in the hazard assessment.

Selection of Respirators

Respiratory Protection will be selected based on information obtained during the hazard assessment and the assigned protection factors for the respirator.
All respirators shall be approved and certified by NIOSH under 42 CFR Part 84 (3).
Air-purifying respirators shall not be used in oxygen deficient atmospheres, IDLH atmospheres or unknown atmospheres.
If the PLHCP determines that an employee's health is at increased risk if a negative pressure respirator is used, the employee will be provided a PAPR if the PLHCP determines that such a respirator can safely be used. Employees may choose to use a Powered Air Purifying Respirator (PAPR) in lieu of a negative pressure respirator ; however, purchase and use of a PAPR is subject to the approval of IH and the employee's supervisor.

Disposable filtering facepieces may be used for nuisance particulate matter at low concentration. Voluntary use of disposable respirators does not require a medical spirometry test or fit test but does require training and compliance with all other aspects of the Respiratory Protection Program, the written approval of an industrial hygienist, and the information provided in Appendix B.

Disposable filtering face masks (N95, P100, N100, R 100) may also be worn for protection against some types of biohazardous agents such as mold. Approval for use must be coordinated through the OHB-Industrial Hygiene.

Medical Surveillance

A medical evaluation will be performed to determine the employee's ability to use a respirator and must be completed before the employee is fit tested or required to use the respirator in the workplace.

The employee's medical status shall be reviewed annually by a PHLCP.

Employees shall contact Medical Services if they experiences physical symptoms that are related to respirator use .

Training

IH shall provide training for each employee who is required to wear a respirator
IH will retrieve respirators from employees out of compliance with the program

Employees who are required to use a respirator will be trained on the following topics before they use the respirator.

- Why the respirator is necessary and how the improper fit, usage, or maintenance can compromise the protective effect of the respirator
- When to wear the respirator
- What the limitations and capabilities of the respirator are
- How to use the respirator effectively in emergencies including situation in which the respirator malfunctions
- How to inspect, put on, remove and use the respirator
- How to clean the respirator (including a hands on cleaning session)
- How to maintain and store the respirator
- How to fit the respirator and perform the user seal check
- How to recognize medical signs and symptoms that may limit or prevent the effective use of a respirator

Refresher training will be conducted annually but also more frequently if:

- A change in the workplace occurs
- A change in the type of respirator occurs
- An employee demonstrates a need for refresher training

Fit Testing

Employees required to wear tight-fitting air-purifying respirators and tight-fitting atmosphere-supplying respirators shall be fit tested

Fit tests are performed in Building 6, Industrial Hygiene lab.

The employee shall be fit tested after the initial medical surveillance but prior to the first use of the respirator and annually thereafter.

USE OF RESPIRATORS

Respirators may not be worn under conditions that would interfere with the facepiece-to-face seal or good fit. Examples of such conditions include:

- Facial hair, facial scars, eyeglasses with sidebars, and headgear that interferes with the seal.
- If glasses must be worn, they must not interfere with the seal of the facepiece. A respirator spectacle kit can be issued when a full-facepiece respirator is required.

Air purifying respirators can only be worn in environments with safe oxygen levels, known contaminants, and for contaminants that have low toxicity and good warning properties
IH will develop a cartridge change out schedule. This change out schedule will determine when the cartridge must be replaced. Air purifying respirators equipped with filters will be changed out when the breathing resistance becomes uncomfortable.

Only full-facepiece pressure-demand supplied-air respirators (SAR) with an auxiliary self-contained air supply or self-contained breathing apparatus (SCBA) may be used in an unknown, oxygen deficient, or IDLH atmosphere.

Before entering the work area, employees shall perform a user seal check for all tight fitting facepieces.
Emergency use of respirators required for GRC employees shall first require the approval of IH.

An employee may choose to become a **Voluntary User** of a respirator. Voluntary users are employees whose hazard assessment or exposure assessment has identified that contaminant concentrations are not high enough to pose an inhalation hazard.

Voluntary use of a filtering facepiece (dust mask) does not require inclusion in the Respiratory Protection Program; it does however, require that the employee receive and understand the information in Appendix B. The form must be reviewed and signed by the employee and their Branch Chief and returned to IH.

Maintenance of Respirators

Respirators shall be inspected before each use and during cleaning. Inspections shall include respirator function, tightness of connections, and the condition of the facepiece, head straps, valves, connecting tube, and cartridges, canisters, or filters and the pliability of rubber/silicone parts for signs of deterioration. If any part of the respirator is found to be deteriorated, the respirator shall be discarded.

- Workers are responsible for the maintenance of their personal respirators. Respirators shall be cleaned and disinfected after each use. If the respirator is used periodically throughout the day it should be cleaned at the end of the day.

Respirators shall be stored in a sealed plastic bag after they have dried completely. They must be stored in a manner that protects them from damage, dust, sunlight, extreme temperatures, excessive moisture, or damaging chemicals.

They shall be stored to prevent deformation of the facepiece or the exhalation valve. Respirators for emergency use must be clearly marked and stored where they are always accessible.

Assuring Continued Respiratory Protection
Employees must leave the hazardous area when:

- They wash their faces and/or respirator facepieces to prevent eye or skin irritation
- They detect vapor, particulate or gas breakthrough
- Changes in breathing resistance occur
- A leak in the facepiece is detected
- They need to replace the respirator, filter, cartridge or canister elements

Respirator Use in Immediately Dangerous to Life or Health Atmospheres
Emergency-use respirators shall be inspected and tagged at least monthly as well as being inspected before and after each use. This inspection is to be performed by the individual who wears the respirator. The SCBA inspection must be documented including the date of inspection, person doing inspection, required remedial action, and identification number for the SCBA. The documentation must be on a tag or label attached to the storage compartment for the SCBA.

When emergency use of respiratory protection is required, call 911 Glenn Dispatcher

SAR's and SCBA's shall only be used by personnel trained in their use and limitations.

The buddy system shall be used where at least one standby person shall be present in a safe area and equipped with the same level of protection as the employee in the IDLH area. Communication (visual, voice, or signal) shall be maintained at all times between the standby person and the individual in the IDLH atmosphere. The employee outside of the IDLH atmosphere must be trained and equipped to provide effective emergency rescue.
Respirator wearers in IDLH atmospheres shall be equipped with retrieval equipment for lifting or removing them from the area or equivalent provisions for rescue shall be in place.

Breathing Air Quality and Use
Breathing air used for respiration shall be of high quality purity. At a minimum, it must meet the specifications for Type1- Grade D breathing air as described in ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-2004.(5) Compressors used to supply breathing air must be constructed and situated as to prevent entry of contaminated air in the air-supply stream and minimize moisture content.

PROGRAM EVALUATION
The Respiratory Protection Program will be reevaluated every year to ensure the program is effective and in compliance with all applicable regulations.

COMPLIANCE
Respirator users who fail to comply with Respirator Program requirements will be referred to their supervisors, and may be removed from the program, or receive a CPAR.

Contractors
Contractor's respiratory protection programs and records will be audited on an annual basis. Results of the audit will be provided to the contract's COTR and program manager. Contractor's employers are required to correct deficiencies.

RECORDS

- Medical evaluations will be maintained by Medical Services and kept for the duration of an employee's employment plus thirty years.
- Fit testing records will be maintained by IH and kept for the duration of employment.
- Hazard Assessments will be maintained by IH
- Exposure Assessments will be maintained by IH

REFERENCES

1. Occupational Safety and Health Administration (OSHA) Respiratory Protection Standard: 29 CFR 1910.134(1) http://www.osha.gov
2. American National Standards Institute (ANSI) "Practices for Respiratory Protection" www.ansi.org http://engineers.ihs.com/abstracts/ansi-z882.jsp
3. NASA HQ NPR 1800.1 Occupational Health Program
4. National Institute for Occupational Safety and Health 42 CFR Part 84: http://www.cdc.gov/niosh/pt84abs2.html
5. OSHA Access to Medical and Exposure Records, 29 CFR.1910.1200, http://www.osha.gov
6. ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-2004, www.cganet.com, http://www.cganet.com/pubs/toc/G-7.1_5%20toc.pdf

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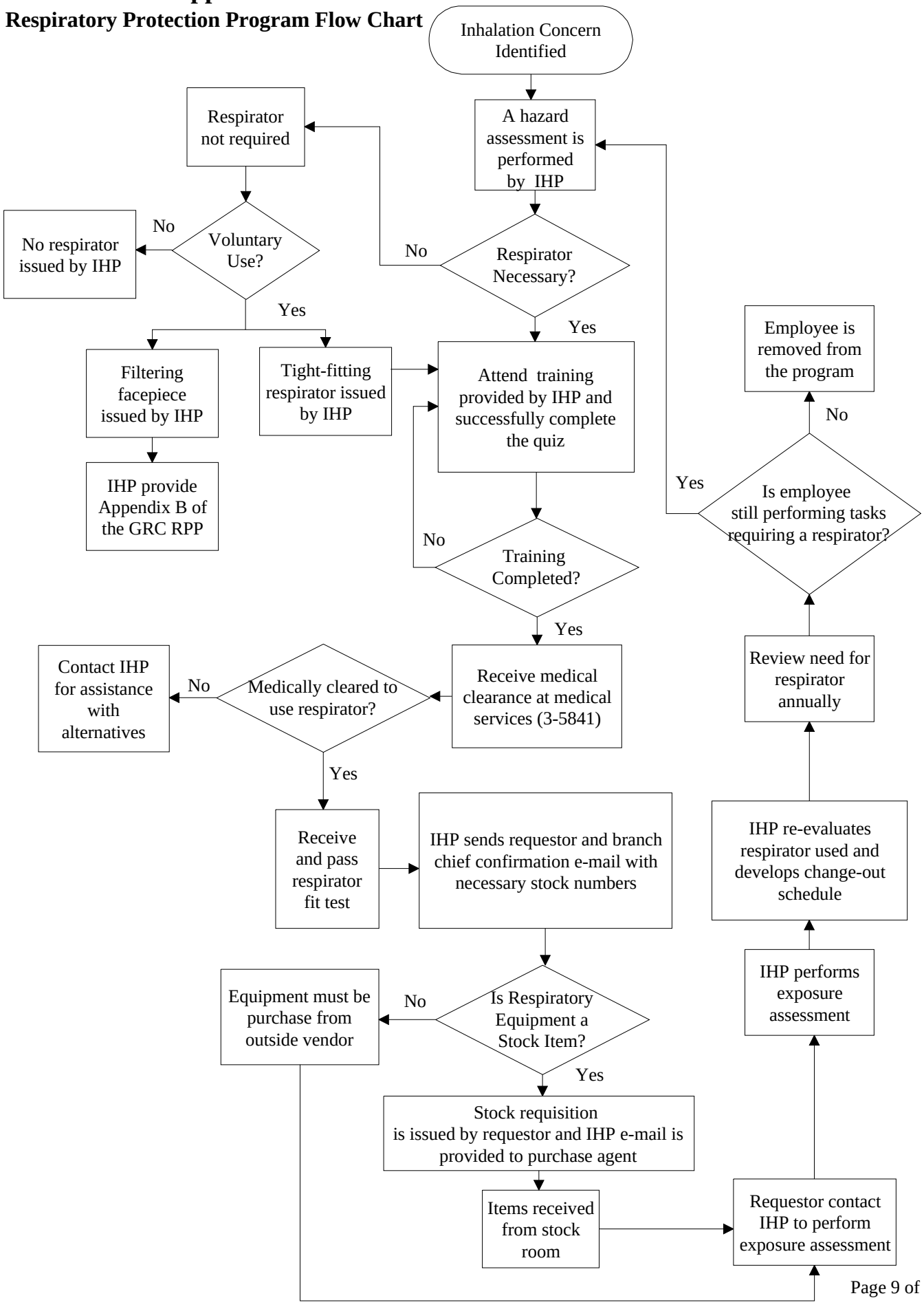
Appendix A

Respiratory Protection Program Flow Chart



Appendix B
Disposable Dust/Mist Respirator Mask Training

Please read the following information on filtering facepieces. If you have any questions, please feel free to contact IH at 3-6762. Once you understand the information please sign at the bottom of this page along with your Branch Chief. Once you and your supervisor have signed this sheet and you completed the Dust Mask Form, please send them back to me at MS 6-4.

Thank you

Always check with the Occupational Health Branch before using any type of respiratory protection to be sure that you are wearing the proper respirator for the inhalation hazard.

Disposable dust masks are controlled stock items (requires Industrial Hygiene sign-off)

- Require training.
- No fit test required.
- No medical spirometry test required.

May be used for **nuisance particulate levels only**.

- Particulate level below the action level. (Solid and non-oil based particles)
- Minimum filter efficiency of 95%
- Not for paints, oil aerosols, gases, vapors, asbestos or sandblasting.
- Not for exposures over the action level for any particulates.
- Not for particulates smaller than 0.3 microns
- Examples for use: grinding, sanding, sweeping, bagging, dusty operations

Donning the mask

- Hold the mask with nosepiece at fingertips and the headbands hanging free.
- Place mask firmly against face with nosepiece over the bridge of your nose.
- Stretch top headband to the back of head above the ears.
- Stretch bottom headband over head and position below ears.
- Adjust the respirator for a comfortable fit. Use both hands to form metal nosepiece to shape of nose for a tight fit
- Conduct a **positive pressure fit check** by cupping hands over mask and exhale slightly. If air leaks around the edges try to reposition the mask for a better fit.
- Change respirator mask if breathing becomes difficult or if the mask becomes damaged or distorted.

I have read the requirements for safe dust mask use and understand them. By signing this document, I agree to comply with the requirements of dust mask use and the Glenn Respiratory Protection Program, Occupational Health Manual Chapter 12.

Employee Name _____

Employee Signature _____ Date _____

Branch Chief _____

Branch Chief Signature _____ Date _____

OHB-Industrial Hygienist _____ Date _____

Dust Mask Form

Date _____

Last Name _____ First Name _____

Job Title _____ Phone _____

Org Code _____ Mail Stop _____ Badge Number _____

Branch Chief _____

Smoker
Yes ☐ No ☐

Job Task Description (task that respirator will be used for)

_____

_____

Frequency
☐ Daily ☐ More than once a week ☐ Once a month
☐ Once a week ☐ Every other week ☐ Every other month

Duration
☐ Less than 1 hour ☐ 2 hours ☐ 4 hours ☐ 6 hours ☐ Over 7 hours
☐ 1 hour ☐ 3 hours ☐ 5 hours ☐ 7 hours

Contaminant(s) (be specific)

_____

Building of Work _____ Room or Location _____

Controls Used
☐ Dust Suppression ☐ Local Exhaust/Ventilation - Hood Number _____
☐ Enclosure ☐ Scrubber ☐ None

Other PPE Used

_____

_____